

REMARKS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1, 2, 6, 7, 11, 14, 18-22, 24, and 30-37 are currently pending. Claims 1, 7, and 11 have been amended; Claims 3-5, 8-10, 12, 13, and 15-17 have been cancelled without prejudice; and Claims 30-37 have been added by the present amendment. The changes and additions to the claims are supported by the originally filed specification and do not add new matter.

In the outstanding Office Action, Claims 1-3 and 22 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,080,970 to Yoshida et al. (hereinafter “the ‘970 patent”); and Claims 1-22 and 24 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,072,162 to Ito et al. (hereinafter “the ‘162 patent”) in view of U.S. Patent No. 6,242,719 to Kano et al. (hereinafter “the ‘719 patent”), and *either* U.S. Patent No. 5,118,983 to Morita et al. (hereinafter “the ‘983 patent”) or U.S. Patent No. 4,536,645 to Mio et al. (hereinafter “the ‘645 patent”).

Applicants wish to thank the Examiner for the interview granted Applicant’s representative on October 26, 2004, at which time a proposed amendment to Claim 1 was discussed. In particular, the “outermost surface” limitation of Claim 1 was discussed with respect to the ‘970 patent. Moreover, the ‘645 patent’s disclosure of alumina was discussed with respect to the claimed oxide glass insulating layer. However, no agreement was reached pending the Examiner’s further consideration of the claims upon formal submission of a response to the outstanding Office Action.

Amended Claim 1 is directed to a ceramic heater to be used in the semiconductor industry for heating a wafer, comprising: (1) a disc-form ceramic substrate having a heating surface configured to heat the wafer and comprising a nitride ceramic or a carbide ceramic;

(2) a resistance heating element comprising at least one circuit, the resistance heating element being arranged on an outermost surface of the ceramic substrate; and (3) an insulating covering deposited on the resistance heating element. Further, Claim 1 recites that the resistance heating element is positioned on an opposite side of the heating surface. Claim 1 has been amended to recite that the insulating covering does not inhibit heat flow to the wafer, and that the insulating covering comprises oxide glass, a limitation previously recited in Claim 4. The changes to Claim 1 are supported by the originally filed specification and do not add new matter.¹

Initially, without limiting the claimed invention, Applicant notes that the invention recited in Claim 1 and new Claim 31 has several advantages over prior art ceramic heaters. First, since the resistance heating element is covered with an insulating covering, it is possible to prevent the resistance heating element from contacting the atmospheric air, and to prevent a change in the resistance of the resistance heating element. Further, by the present invention it is also possible *to prevent heat from radiating from the resistance heating element face and to prevent the temperature of the heating surface from lowering*. Moreover, since the resistance heating element is positioned on an opposite side of the heating surface, the distance between the wafer and the heating surface is kept even. Therefore, it is possible to heat a wafer evenly. As shown in the tables in the specification, the change in the resistance of the resistance heating element is as small as 0.1% to 0.3% when the insulating covering comprising oxide glass is present. On the other hand, when no insulating covering is present, the change in the resistance of the resistance heating element is as large as 20% (Comparative Example 2). Thus, it is clearly shown that the insulating covering prevents the resistance change. Further, the temperature change is as small as 0.1°C to 0.2°C when the insulating covering is present. On the other hand, when no insulating covering is present, the

¹ See Figures 2 and original Claim 3.

temperature change is 0.5°C. Thus, the insulating covering provides for an excellent heat retention property. Further, Applicant notes that in the semiconductor industry, it is essential to heat a wafer evenly. Accordingly, it is necessary to prevent a temperature change in the heating surface. Thus, the present inventor recognized that disposing an insulating covering comprising an oxide glass on the resistance heating element prevents a change in the resistance value, which is a factor of the temperature change in the heating surface. Further, heat radiation from the back surface is also prevented. Therefore, the ceramic heater according to the present invention has excellent properties as a ceramic heater used in the semiconductor industry.

Regarding the rejection of Claim 1 as anticipated by the '970 patent, the '970 patent is directed to a wafer heating apparatus comprising a heating resistor 4 buried in a substrate 2.² However, Applicant respectfully submits that the '970 patent fails to disclose a resistance heating element arranged on an outermost surface of a nitride or carbide ceramic substrate, as recited in amended Claim 1. Further, Applicant respectfully submits that the '970 patent fails to disclose an insulating covering that comprises oxide glass, as recited in amended Claim 1. Accordingly, Applicant respectfully submits that the rejection of Claim 1 (and dependent Claims 2 and 22) as anticipated by the '970 patent is rendered moot by the present amendment to Claim 1. Further, Applicant respectfully submits that the rejection of Claim 3 as anticipated by the '970 patent is rendered moot by the present cancellation of that claim.

Regarding the rejection of Claim 1 under 35 U.S.C. § 103, the Office Action asserts that the '162 patent discloses everything in Claim 1 with the exception of the ceramic substrate being disc-shaped and an insulating covering deposited on the heating element, and relies on the '719 patent and either the '983 or the '645 patent to remedy those deficiencies.

² See Figure 1b and col. 4, lines 16-21 of the '970 patent.

The '162 patent is directed to a device for heating a substrate and includes heating elements 14 and the heat diffusion plate 11 made of AlN.³ Applicant notes that the heating device according to the '162 patent corresponds to the ceramic heater of Comparative Example 2 disclosed in the specification of the present application. Further, as admitted in the Office Action, the '162 patent fails to disclose a disc-form ceramic substrate and the insulating covering recited in amended Claim 1.

The '719 patent is directed to a multi-layered ceramic heater including a support substrate 2, a heater pattern 3 adhered to the surface of the support substrate 2, and a protective layer 4, composed of the same material as a support substrate 2 and covering the heater pattern 3.⁴ As illustrated in Figure 3, the heat generating layer 3 disclosed by the '719 patent is formed on the heating surface. The heating surface is not flat and the distance between the substrate and the wafer is uneven. Accordingly, the heater disclosed by the '719 patent is not configured to heat the wafer uniformly. Further, Applicant notes that the '719 patent discloses that AlN, Bn, or an equivalent material is used to form the protective layer, which is formed by chemical vapor deposition.⁵ However, Applicant respectfully submits that the '719 patent fails to disclose the insulating covering recited in Claim 1, which comprises oxide glass, i.e., a material different from the material of the claimed ceramic substrate. Further, Applicant notes that the '719 patent fails to mention the word "glass" at all. Moreover, the protective layer 4 disclosed by the '719 patent inhibits heat flow to the wafer, as shown in Figure 3. Accordingly, Applicants submit that the '719 patent fails to disclose the insulating covering recited in amended Claim 1.

The '983 patent is directed to a thermionic electron source comprising a ceramic substrate, a high density resistive film 2, and a vitreous protective coating layer 3. However,

³ See '162 patent, Figure 2.

⁴ See '719 patent, col. 4, lines 44-51.

⁵ See '719 patent, col. 6, lines 13-17 and 30.

Applicant respectfully submits that the '983 patent is directed to nonanalogous art. As noted in In re Wood,

[t]he determination that a reference is from a nonanalogous art is therefore two-fold. First, we decide that the reference is within the field of the inventor's endeavor. If it is not, we proceed to determine whether the reference is recently pertinent to the particular problem to which the inventor was involved.⁶

The Office Action has not indicated that thermionic electron sources could be considered within the field of Applicant's invention. Ceramic heaters and thermionic electron sources are directed to two completely different fields. Moreover, the Office Action has not identified why one of ordinary skill in the art of ceramic heaters would have believed that thermionic electron sources were pertinent to the problems solved by the invention. Not recognizing the pertinence of the field to the problem, one of ordinary skill would never have been motivated to make the asserted combination. Accordingly, Applicant respectfully submits that the '983 patent is nonanalogous art and is not properly combinable with the teachings of the '162 and '719 patents.

The '645 patent is directed to a solid body heating unit comprising a sheet-like base 1, a refractory layer 2, an electroconductive layer 3, and an electrically insulative protective layer 6. The '645 patent discloses that the electroconductive layer 3 is covered with the protective layer 6 to protect the user from electric shock.⁷ Further, the '645 patent discloses that the protective layer 6 is made of silicon resin or alumina. However, the protective layer 6 disclosed by the '645 patent necessarily inhibits heat flow to the heating surface. Accordingly, Applicant submits that the '645 patent fails to disclose the insulating covering recited in amended Claim 1. Further, Applicant notes that the '645 patent fails to use the

⁶ In re Wood, 599 F.2d 1032 (CCPA 1979).

⁷ See '645 patent, col. 2, lines 32-34.

word “glass,” as recited in amended Claim 1. Thus, Applicant respectfully submits that the ‘645 patent fails to disclose an insulating covering comprising oxide glass.

Thus, no matter how the teachings of the ‘162, ‘719, and ‘645 patents are combined, the combination does not teach or suggest an insulated covering deposited on a resistance heating element, wherein the insulating covering comprises oxide glass and the insulating covering does not inhibit heat flow to a wafer, as recited in amended Claim 1. Accordingly, Applicant respectfully submits that the rejection of Claim 1 (and all associated dependent claims) is rendered moot by the present amendment to Claim 1. Further, as discussed above, Applicant respectfully submits that the ‘983 patent is nonanalogous art and is not properly combinable with the teachings of the ‘162 and ‘719 patents.

The Office Action asserts that it would have been obvious to one of ordinary skill in the art to combine the teachings of the cited references “so as to further uniformly heat the disc shaped wafers and a disc shaped ceramic heater” and to “protect the heating element having one or more circuits” and “to protect the heating element without incurring extraneous material cost and without lessening the heating capacity of the ceramic heater.”⁸ However, Applicant respectfully submits that the Office Action is simply stating perceived advantages of Applicant’s invention as motivation to combine the ‘162, ‘719, ‘983, and ‘645 patents, without identifying that, absent Applicant’s specification, one of ordinary skill in the art would have even thought to address the problem. Such hindsight reconstruction of Applicant’s invention can not be used to establish a *prima facie* case of obviousness.

Further, Applicants note that, in the outstanding Office Action, the Examiner has failed to provide any motivation for combining the teachings of the cited references. The Office Action must show that the motivation for the combination can be found in the prior art. However, the Office Action fails to point to a specific statement in any of the cited

⁸ See page 4 of the Office Action dated November 4, 2003.

references that suggests or provides a motivation for combining the teachings of those references. The Office Action has also failed to show that the motivation existed in the art, although not in the cited references. Thus, the Office Action has failed to show factually by one of ordinary skill in the art would have been motivated to select, from all available teachings, the disclosure of the protective layer 4 disclosed by the '719 patent to serve as an insulating film in a modified version of the ceramic heater disclosed by the '162 patent. As the Federal Circuit held, in In re Sang-Su Lee,

[t]he factual inquiry whether to combine references must be thorough and searching. It must be based on objective evidence of record. This precedent has been reinforced in myriad decisions, and cannot be dispensed with.... The factual question of motivation is material to patentability, and cannot be resolved on subjective belief and unknown authority.⁹

The present amendment also sets for new Claims 30-37 for examination on the merits. New Claim 30, which depends from Claim 1, recites that the ceramic heater further comprises an insulating layer on the opposite side of the heating surface, wherein the resistance heating element is positioned on the insulating layer. New Claim 30 is supported by the originally filed specification and does not add new matter.¹⁰ Further, based on the asserted allowability of Claim 1, Applicant respectfully submits that new Claim 30 patentably defines over the cited references.

New Claim 31 recites the limitations of amended Claim 1, except that Claim 31 recites that the insulating covering comprises resin, rather than oxide glass. New Claims 32-37, which depend from new Claim 31, further clarify the invention recited in new Claim 31. No new matter has been added.¹¹ Moreover, for the reasons stated above for the patentability

⁹ In re Sang Su Lee, 277 F.3d 1338 (Fed. Circ. 2002). Emphasis added.

¹⁰ See, e.g., page 8, lines 13-25 of the specification.

¹¹ See, e.g., original Claim 5.

Application No. 09/869,321
Reply to Office Action of November 4, 2003 and
the Advisory Action of May 11, 2004

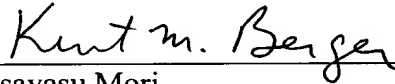
of Claim 1, Applicant submits that new Claims 31-37 patentably define over the cited references.

Thus, it is respectfully submitted that independent Claims 1 and 31 (and all associated dependent claims) patentably defines over any proper combination of the '970, '162, '719, '983, and '645 patents.

Consequently, in view of the present amendment and in light of the above discussion, the outstanding grounds for rejection are believed to have been overcome. The application as amended herewith is believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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